

# Revealing Transient Factors in Diet Choices

Ksenia Rubin  
Dept. of Computer Science  
2500 University Drive NW  
Calgary AB  
1 (403) 220-6015  
krubin@ucalgary.ca

Anthony Tang  
Dept. of Computer Science  
2500 University Drive NW  
Calgary AB  
1 (403) 220-6015  
tonyt@ucalgary.ca

Ehud Sharlin  
Dept. of Computer Science  
2500 University Drive NW  
Calgary AB  
1 (403) 220-6015  
ehud@cpsc.ucalgary.ca

## ABSTRACT

Identifying the factors that impact personal health choices can be a challenging task. While much prior work explores tracking the relationship between diet and exercise, there are many other transient factors that affect our nutritional choices. In this work, we design an interface that allows users to explore how dietary choices are affected by factors such as time, location, company, mood, and stress levels. To support our research we plan to develop an application that will allow visualization of patterns in mood and blood pressure, as well as facilitate personal review of food choices and eating habits.

## Categories and Subject Descriptors

H.5.m [Information Interfaces and Presentation]:  
Miscellaneous.

## General Terms

Design, Human Factors.

## Keywords

Self-reflection, habits, food, stress, photo diary, personal informatics.

## 1. INTRODUCTION

Eating habits are often elusive making it difficult to pinpoint exactly what makes someone eat, for example, half a tub of ice cream at midnight on a Monday. We all make unhealthy choices from time to time, but the lack of reflection on those choices is what carries some into a completely unhealthy lifestyle. Diet and exercise are the two main areas examined when it comes to personal health. However, diet is influenced by a number of fleeting, transient factors that are often ignored, such as mood, time, company, and location. Our work aims to use personal informatics to shed light on these factors in a tangible, intimate way. Below we briefly discuss the four transient factors our work addresses.

*Mood.* Our emotions/mood often play a role in what we choose to eat [6,7]. For example, “comfort food” (referring to unhealthy meals and snacks) are consumed in response solely to emotions, and not hunger. Multiple factors can trigger emotional eating, such as company, mood and situation, among others [6]. Depending on personal preference, certain moods can be related with choosing to eat certain types of food [7]. For example, stress prompts us to crave rich foods, but frequently responding to stress in this way can lead to serious health problems in the long run [8, 9].

*Time.* Time of meals is often discounted as irrelevant due to identical caloric intake; however previous work suggests that eating late at night may contribute to weight gain [10]. Busy schedules and lack of necessary effort may lead to late meals and snacks, and skipping meals, sometimes even without acknowledgement of the average time of regular daily meals.

*Company & Location.* Eating out with a group of friends can be seen as another culprit for unhealthy choices. Lumeng and Hillman studied the effects of eating in larger versus smaller groups [5], finding that children are likely to consume 30% more food when eating in groups of 9 versus groups of 3. While eating at restaurants tends to be high in calorie count, one study suggests that a mindful eating approach can help individuals make better choices when dining out frequently [11], highlighting the importance of critically reflecting about what one consumes.

Identifying mentioned unhealthy habits and certain patterns in an individual’s behavior may help her recognize the situation and potentially opt for different food choices. We believe that personal information appliances can play a pivotal role in helping people gain awareness and track such transient factors, allowing them to make better diet choices.

## 2. RELATED WORK

The relationships between diet, exercise and other factors that affect our health have been studied extensively. A problem being addressed by many researchers is how to easily track, manage, and draw conclusions from personal data relating to our nutrition, with the ultimate goal of improving health related choices.

Brown et al. [1] address the problem that existing diet and exercise monitoring systems are inconvenient to use as they rely on hand-written diaries. FotoFit aims to promote a healthier life style through personal reflection. The system consists of a mobile application to track food on the go using a camera, an exercise machine application, and a PC visualization application for review, reflection, and goals. The photos were found to be effective in helping track dietary habits, and to aid interpreting exercise activity. Further, visualizing the relationship between diet and exercise was also effective.

Gonzales et al. [2] consider more deeply the utility of self-reflection in daily health-related decision making. Virtual Environments to Raise Awareness (VERA) is a mobile application focused on helping individuals become self-aware through self-observation of their actions and choices. VERA forces instant evaluation of health related choices by requiring users to log actions, forcing them to stop and think about them. After using the application, participants found that they were more likely to make better choices, especially if their choices were visible to other individuals. While it helped them self-reflect and

make better choices, it did not in the long run change their health related habits, possibly due to the short duration of the study. This study further displays the importance of personal reflection on health related choices, but allows for review of only actions, missing the chance to better understand what affected the choice.

Stress is one of the major factors that significantly affect our health, but it is often overlooked. Sanches et al. [4] found it difficult to effectively measure and correctly interpret the cause of stress using non-invasive measures [4]. Rather, they explore the exposing of real-time biosensor data to people, allowing them to reflect on stress levels for diagnosis.

Creating personal health informatics applications that are customized to the needs of an individual can be a difficult and time-consuming task. Medynskiy and Mynatt identified the need for a platform to develop personal health informatics applications for individuals trying to manage chronic health conditions [3]. They developed the Salud! Application Programming Interface (API) and a personal health informatics application using the API. Salud! allows to easily develop automated and interactive data entry services depending on the requirements of the particular individual and his/her condition [3].

Much prior work has focused on capturing tangible “health choices” (exercise and diet); however, many transient factors actually influence these health choices. Earlier, we discussed how mood, timing of meals, company, and even meal location can influence our dietary choices. Revealing the relationship between these transient factors and diet might also help people to make better health choices, and will be the main focus of our research.

### 3. SHEDDING LIGHT ON TRANSIENT FACTORS

#### 3.1 Data Collection and Dataset

The data will be manually collected by a single user for the period of two weeks. We will define food as to include not only the things one eats, but also the things one drink as beverages may contain considerable nutritional value. The following data will be recorded in the style of a diary with the help of the user’s mobile device: food (what is consumed, a description, a photo, and a rating of enjoyment); mood (before, mid-way through meal; after meal—captured as one to three adjectives); location; time; blood pressure (as a measure of stress [9]); hunger (Likert scale), and company (how many people are dining).

*Food.* Every event of food consumption will be classified as a breakfast, lunch, dinner or a snack. A photo of the food will be taken prior to consumption and afterwards: this will help the individual gauge how much of the serving was actually consumed out of the available amount of food and reflect on how the aesthetics of the dish and the eating environment affect the diet choice. A brief description of the food may be recorded, if deemed necessary. Whether or not the food was enjoyed will be rated on a scale of 1 to 5 in order to better explain why food may not have been finished.

*Mood.* Before, about mid-way, and after the consumption of the food, mood will be recorded as 1-3 adjectives. At the time of data collection, I will not be restricted to any particular subset of adjectives to describe mood and I will be free to use all words in my vocabulary. At the time of analysis, it’s likely that every mood description will be classified on a negative-to-positive scale for consistency and generalization purposes.

*Location.* At every event of food consumption, location will be described as home, work/school, or restaurant.

*Time.* With the help of the mobile application used to record all the data in a diary format, all entries will be precisely timed. Time data can also be extracted from the photographs taken at the time of the consumption.

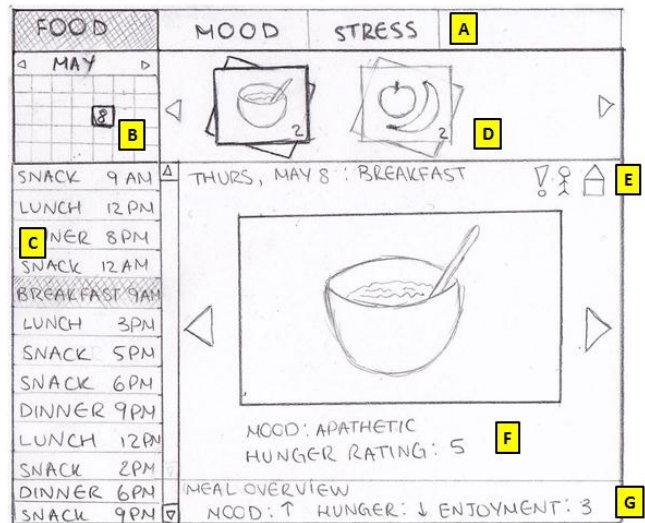
*Blood Pressure.* Blood pressure will be measured every hour for the duration of the waking day and prior to every consumption. This data will be representative of current stress levels [9].

*Hunger Rating.* A rating of hunger from 1 to 5 will be recorded at every event of consumption. This data will help identify how often food is consumed without real necessity.

*Company.* The user will record whether they eating alone or with other people. A person will only count as company if he/she is also consuming food.

### 3.2 Design Approach

As outline earlier, the intention is to reveal patterns between transient factors and diet. Our desktop app will allow people to review his/her meal diary in the style of a photo album. It will be organized by date and grouped by meals, while displaying all other relevant information pertaining to the meal at hand. Visual representation of mood and blood pressure cycles will be available in separate sections to allow the user to see patterns in his/her personal data.



**Figure 1. Low-fidelity sketch of the proposed interface**

- A. Separate tabs for food review, mood and stress cycle visualization. Food tab selected in sketch.
- B. Calendar for date selection.
- C. Continuous scroll meal log: select a meal to view in detail. May 8, Breakfast is selected.
- D. Albums of items eaten during the meal: each album should contain at least two photos (before and after). The number in the corner of each image is the photo count.
- E. Icons: stress level (!, !!, !!!), company (one or multiple persons icon), and location (home, work/school, restaurant) depicted from left to right.
- F. Image, mood and hunger rating of the “before” photo. A time stamp should be included.
- G. Meal overview: how did mood and hunger change from start to end; was the meal enjoyable?

## 4. TIMELINE

Below is a tentative timeline of milestones we hope to accomplish before the end of the term.

Date	Milestone
January 27	Proposal Deadline
January 30	Data Collection and Compilation
February 13	Application Design Stage
February 27	Start of Implementation
March 19	Testing and Final App Revisions
April 5	Final Report Deadline
April 9	Final Presentation

Table 1. Tentative Timeline

## 5. CONCLUSION

### 5.1 Limitations

Due to the limited dataset size collected over two weeks, it may be difficult to recognize unfamiliar patterns in eating behavior and its relevant factors. There are likely many more factors that we could relate to affecting food consumption, but there is a necessity to limit the scope of the study. Consequently, only the listed factors will be considered, as they seem to be the most likely to produce interesting and relevant results. Since we will have only a single user at this phase of the project, the design of the application may be biased and may require revision if dealing with different eating patterns. An interesting layer of this work is understanding and compensating for the fact that the nature of the data collected may be very intimate to the subject, and it is likely that the data collection process will be fairly intrusive and labor intensive. This could lead to some bias in the data such as increased stress, change in mood, and different food choices, biases which we will have to account for if and when they manifest themselves in the observations.

### 5.2 Future Work

This application for this short term project will be developed strictly for the PC, and is mainly designed to facilitate self-reflection which would hopefully lead to better understanding of personal nutrition choices and facilitate a change in unhealthy diet behavior. A similar future mobile application, however, would be able to offer a number of different services to the user on the go. Based on one's data, discoveries can be made about one's eating habits in relation to mood, stress, location, company, etc. In the future we see an application that could attempt to predict the most stressful times in one's day/month, one's eating habits based on location, as well as in relation to other factors, and remind or warn one about potential situations where one is likely to make unhealthy choices. Different factors may be considered in relation to one's food intake, such as tracking exercise patterns, giving more insight to food choices and eating habits. An infrastructure such as Salud! API [3] may be extremely helpful in data collection for a mobile application.

With the increase of popularity in social networking website, the desktop or mobile applications could both provide the functionality to share whatever information the particular user is comfortable with sharing over various websites such as Facebook and Twitter.

Personal reflection and understanding of factors that affect one's nutritional choices are substantial in the improvement of one's nutrition and this application may give individuals insight into patterns and behaviors previously unknown to them.

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